First preliminary results of the adjustment exercise using ASPIS Fe88 and SNEAK-7A/7B k_{eff} & β_{eff} benchmarks

I. Kodeli, L. Plevnik (JSI, Ljubljana, Slovenia)

PURPOSE

-   ND validation and adjustment exercise involving different (other than k_{eff}) benchmarks providing a complementary view and wide scope validation:

    -   Critical benchmarks

    -   Kinetics measurements

    -   Shielding benchmarks

I. Kodeli, Sensitivity and Uncertainty in the Effective Delayed Neutron Fraction (β_{eff}), *Nucl. Instr. & Methods in Phy. Res. A* **715** (2013) 70-78

ASPIS IRON-88 – computational vs. experimental uncertainties

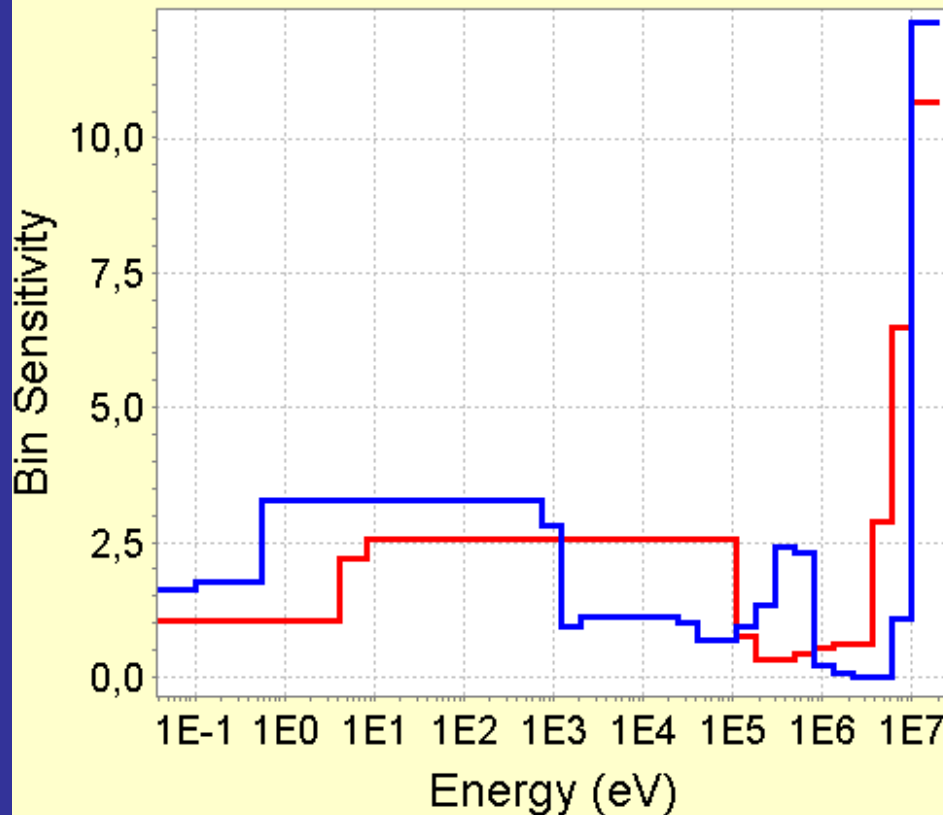| Reaction		ΔC (%)				ΔE (%)
		Σ_{tr} (ENDF/B7.1)	σ_{SAD} (P_N) (EFF-2.4)	Σ_d (IRDFF)	Total	
^{32}S(n,p)	A7	9.3	1.3	~3	**9.9**	**6.5**
	A12	19.4	2.2	3.5	**19.8**	**6.5**
	A14	24.0	2.5	3.5	**24.3**	**8.6**
^{115}In(n,n')	A7	10.1	0.6	~2	**10.3**	**4.5**
	A11	15.1	0.9	~2	**15.5**	**4.7**
^{103}Rh(n,n')	A7	5.7		~1	**5.8**	**5.1**
	A11	18.5		~1	**18.5**	**5.1**
^{27}Al(n,a)	A7	12.4	3.4	~0.5	**(12.9)**	**4.7**
^{197}Au(n,γ)	A7	10.0	0.1	0.2	**10.0**	**4.2**
	A11	8.8	0.1	0.2	**8.8**	**4.2**
	A14	8.0	0.1	0.2	**8.0**	**4.2**

FILES PREPARED

- Benchmarks/responses considered:
  - **FLATTOP-Pu, SNEAK-7A & -7B: k_{eff}** and β_{eff},
  - **ASPIS-FE88**: reaction rates ^{197}Au(n,γ), ^{32}S(n,p), ^{103}Rh(n,n'), ^{115}In(n,n'), ^{27}Al(n,α)
- Cross-section sensitivity profiles to:
  - Isotopes: U-234, -235, -238, Pu-239, -240, -241; O-16, Fe-56,
  - Reactions: σ_t, σ_{el}, σ_{inel}, σ_c, ν_p, ν_d, χ, P_1(elastic), (n,α) for O-16; detector responses to be included,
  - 33 ECCO energy group structure,
- C/E values and uncertainties: ΔE (systematic & statistical) and ΔC (M/C statistics),
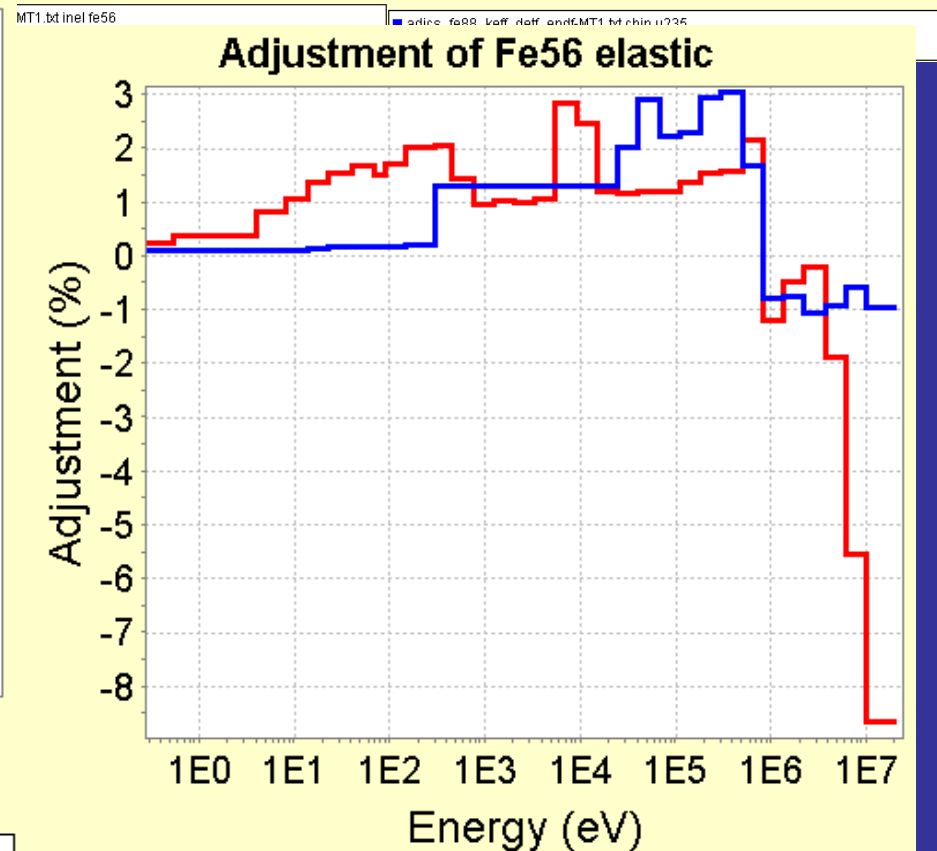- Infinite diluted cross-sections from ENDF/B-VII.1 in 33 groups.

**Examples of adjustment results: ENDF/BVII.1 vs. JENDL-4.0**

Adjustment of Fe56 inelastic

Adjustment of U235 PFNS
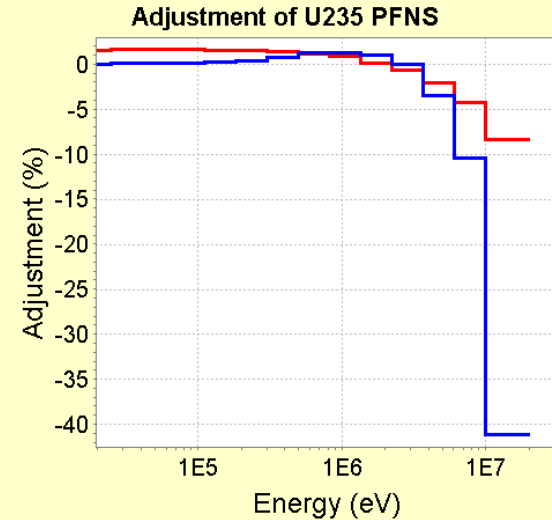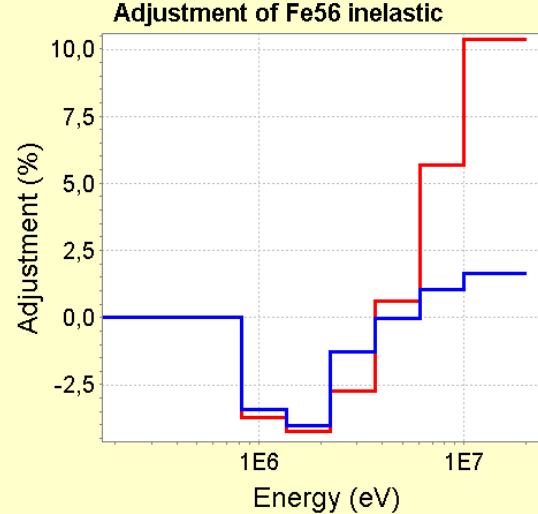
Adjustment of Fe56(n,g)

Adjustment of Fe56 elastic

MT1.txt inel fe56

adjcs_fe88_keff_detf_endf-MT1.txt chin u235

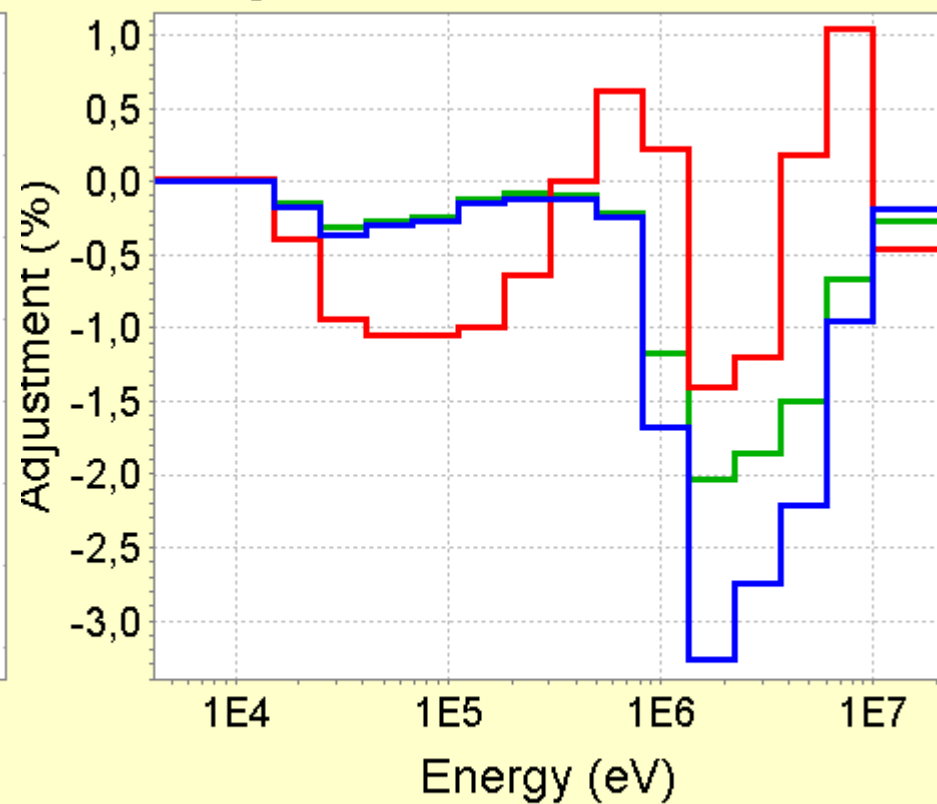- adjcs_fe88_keff_detf_endf-MT1.txt g fe56
- adjcs_fe88_keff_beff_detf_jendl-MT1.txt g fe56

- adjcs_fe88_keff_detf_endf-MT1.txt elas fe56
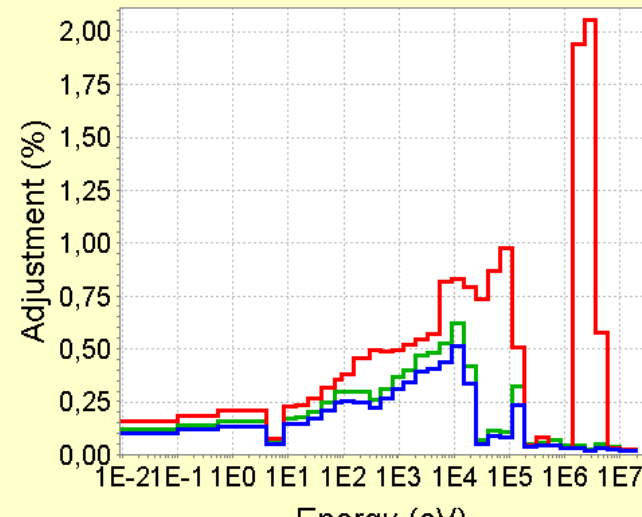
Adjustment of U238 inelastic
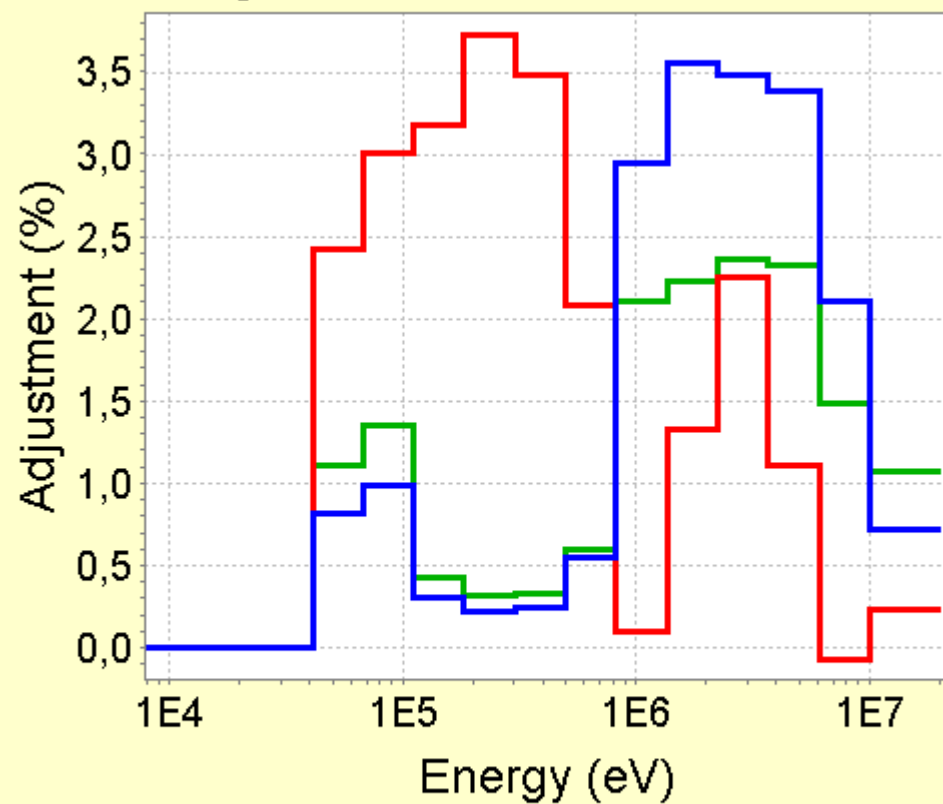
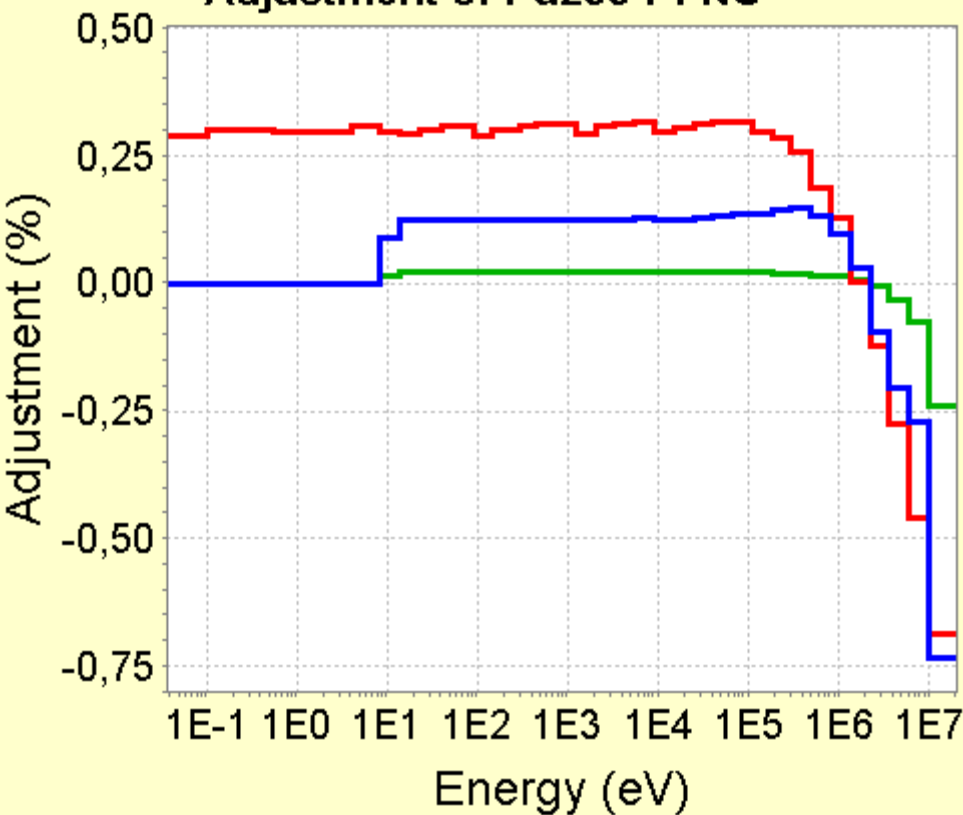## Adjustment of U238 elastic

- ■ adjcs_fe88_keff_detf_endf-MT1.txt inel u238
- ■ adjcs_fe88_keff_beff_detf_jendl-MT1.txt inel u238
- ■ adjcs_fe88_keff_beff_detf_endfj-MT1.txt inel u238

adjcs_fe88_keff_detf_endf
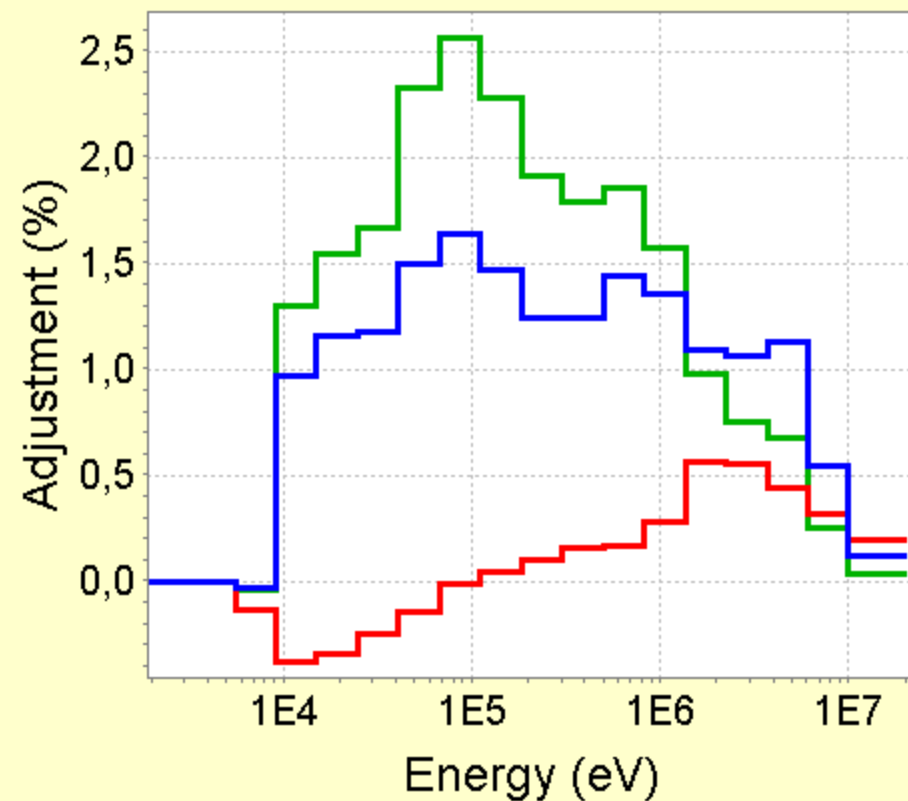adjcs_fe88_keff_beff_detf_
adjcs_fe88_keff_beff_detf_

Adjustment of U238(n,g)
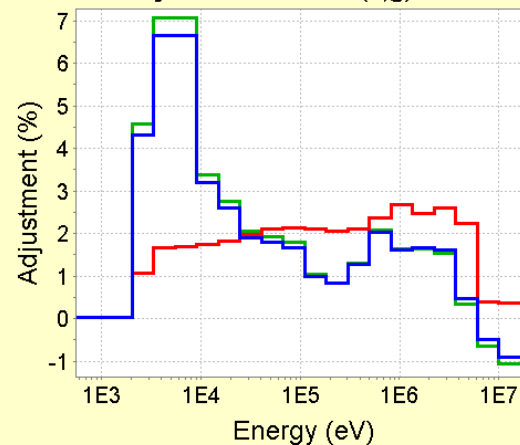
Adjustment of Pu239 PFNS
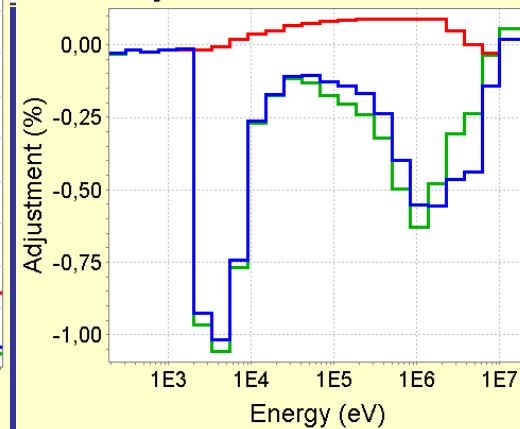
Adjustment of Pu239 inelastic

- adjcs_fe88_keff_detf_endf-MT1.txt chip pu239
- adjcs_fe88_keff_beff_detf_jendl-MT1.txt chip pu239
- adjcs_fe88_keff_beff_detf_endfj-MT1.txt chip pu239

adjcs_fe88_keff_detf_endf-MT1.txt inel pu239
adjcs_fe88_keff_beff_detf_jendl-MT1.txt inel pu239

Adjustment of Pu239(n,g)

Adjustment of Pu239 elastic

Conclusions

- Use of kinetics measurements and shielding benchmarks in addition to critical benchmarks is suggested for ND validation & adjustment since providing a complementary view and wider scope validation;
- Sensitivity profiles, C/E values and the corresponding uncertainties available from NEA in 33-groups for FLATTOP-Pu, SNEAK-7A & 7B and ASPIS-Fe88 benchmarks.
- For validation and demonstration purposes the adjustment exercise was performed using ENDF/B-VII.1 and JENDL-4.0 covariances.